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Detection of Pneumonia and Covid-19 using Deep Learning

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Abstract: Coronavirus disease is an infectious disease caused by SARS-CoV-2 virus it can spread through touch or by sneezing in front of someone and leads to death of an individual and Pneumonia is caused by virus, bacteria and fungi Pneumonia is an infection that inflames the air sacs in one or both lungs. To detect these two we proposed a model it will detect the kind of disease whether the person is normal or he is suffering from viral pneumonia or bacterial pneumonia or Covid-19 by collecting X-ray copy of the Patient.

Keywords: Covid-19 Detection, Pneumonia Detection, vgg16, Convolution Neural Network, Deep Learning.

I. INTRODUCTION

- Coronavirus is the large family of virus that can cause illness from common cold to more severe diseases and it can be transmitted between peoples and the animals, The common signs of infections are cough, fever, loss of taste, tiredness, respiratory symptoms, breathing problem and it can also cause pneumonia. It can be contaminated through closely interaction with the infected person and by touching the object that is affected by virus.
- COVID-19 signs and indications are almost identical to the pneumonia, if not properly diagnose will lead to incorrect diagnosis now that many hospitals around the world are congested. Many of these hospitals are working 24/7 due to massive increase of infections and most of its medical personnel are also infected with the virus.

II. PROPOSED SYSTEM

- This System will detect whether the person is normal or infected by pneumonia and covid.
- We are using a vgg16 algorithm and convolution method by inserting a X-ray of individual person in web based application.

III. REQUIREMENTS ANALYSIS

The requirements for a system describe the functionality or services that the system is expected to provide and which specify criteria that can be used to judge the operation of a system, rather than specific behaviors.

Hardware Requirements

- Processor: Intel(R) Core(TM) i5 CPU @1.70Ghz
- Installed memory (RAM): 4.00GB
- System type: 64-bit Operating System, x64-based processor
- Total size of Hard disk: 1TB

Software Requirements

- Operating System : Windows 10
- Programming Language: Python, html, css.
- Software : Anaconda 3.7
    - Python framework: Flask.

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IV. FLOW DIAGRAM

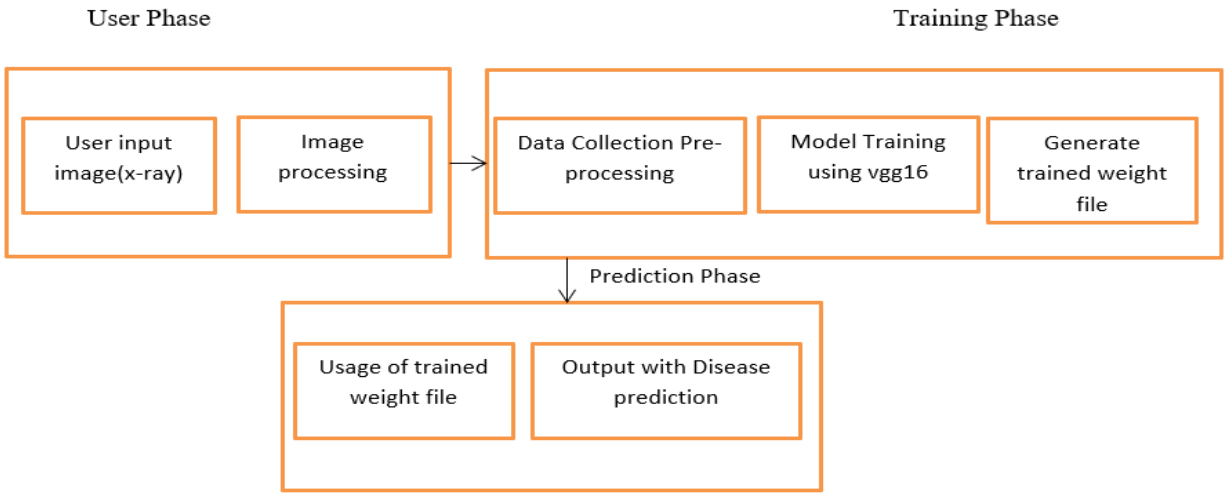

Fig. 1 A process Flow diagram

The above Fig (Fig .1 A process flow Diagram) represents in three phase that are User Phase, Training Phase, Prediction Phase.

User Phase: Proposed system design do have user phase in which Input images are used to feed to trained model before feeding to trained model images needs to undergo image processing in which it will convert to numpy array or array format then enters to Training Phase.

Training Phase: This is a phase where complete model training takes places in which before training the model, Dataset are collection from Kaggle (https://www.kaggle.com/tawsifurrahman/covid19-radiography-database) in which these are the real world dataset from medical institute itself. Then it undergoes Data pre-processing where in which we will remove corrupted images Then those images are used for training the model using vgg16 Convolutional Neural Network deep learning algorithm, trained model will be saved for for prediction.

Prediction phase: trained weight files are used or will load the saved/trained weight files for prediction final output will be the multi class pneumonia disease prediction.

V. TOOLS AND TECHNOLOGY OVERVIEW

IDE USED:

1. **PyCharm:**
   PyCharm Integrated Development Environment PyCharm is an integrated programming environment that is used for processor training. It has code analysis, a graphical debugger, and Flask support for web development. PyCharm enables users to quickly and efficiently create a variety of Python software applications. The PyCharm UI can even be customized to meet the needs and tastes of developers.
2. **Jupyter:**
   Jupyter was created to create open-source software. It's used in dozens of programming languages for open-standards and interactive computing services. It's an opensource web application that lets you write and share code and documents in real time. This is a significant benefit of Jupyter. It can be used for data cleansing and transformation, numerical simulation, statistical modelling, machine learning, and a variety of other tasks. To run the algorithm, we utilized Jupyter.

Programming languages used:

1. **Python:**
   Python is a dynamically semantic, interpreted, object-oriented high-level programming language. Its high-level built-in data structures, together with dynamic typing and dynamic binding, making it ideal for Rapid Application Development and as a scripting or glue language for connecting existing components. Python's concise, easy-to-learn syntax promotes readability, which lowers software maintenance costs. Modules and packages are supported by Python, which facilitates programme modularity and code reuse. The Python interpreter and its substantial standard library are free to download and distribute in source or binary form for all major platforms.
   Python is popular among programmers because of the enhanced productivity it offers. The edittest-debug cycle is extraordinarily rapid because there is no compilation step. Python scripts are simple to debug: a bug or improper

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input will never result in a segmentation fault. Instead, when the interpreter finds a mistake, it throws an exception. The interpreter prints a stack trace if the application fails to catch the exception. Inspection of local and global variables, execution of arbitrary expressions, setting breakpoints, stepping through the code one line at a time, and so on are all possible with a source level debugger. The debugger is written in Python, demonstrating Python's introspective capabilities. On the other hand, adding a few print statements to the source code is frequently the quickest method to debug a programme: the fast edit-test-debug cycle makes this simple approach quite successful.

2. **HTML:**

HTML (HyperText Markup Language) is the coding that organizes a web page's structure and content. Content could be organized using paragraphs, a list of bulleted points, or graphics and data tables, for example. This tutorial will teach you a fundamental understanding of HTML and its purposes, as the title suggests.

HTML is made up of a set of elements that you may employ to enclose or wrap certain parts of your content to make it seem or perform a certain manner. The surrounding tags can be used to make a word or image hyperlink to another location, italicise words, change the font size, and so on.

3. **CSS:**

CSS (Cascading Style Sheets) is a style sheet language for expressing how a document authored in a markup language like HTML or XML looks (including XML dialects such as SVG, MathML or XHTML). Along with HTML and JavaScript, CSS is a key component of the World Wide Web. CSS is a style sheet that allows you to separate presentation from content, including layout, colours, and fonts. This separation can improve content accessibility, provide more flexibility and control in the specification of presentation characteristics, allow multiple web pages to share formatting by specifying the relevant CSS in a separate.css file, which reduces complexity and repetition in the structural content, and allow the.css file to be cached to improve page load speed between the pages that share the file and its formatting.

4. **Flask:**

Flask is an open-source web framework. This means flask gives you the tools, frameworks, and technologies you need to create a web app. This web application can be as simple as a set of web pages, a blog, or a wiki, or as complex as a web-based calendar or a commercial website.

Flask is one of the micro-categories. framework's Micro-frameworks are typically frameworks that do not rely on external libraries. This has both advantages and disadvantages. Pros are that the framework is light, that there are few dependencies to update, and that you can keep an eye out for security flaws; drawbacks are that you will have to do more work on your own at times, or that you will have to grow your list of dependents by adding plugins.

VI. MODEL TRAINING

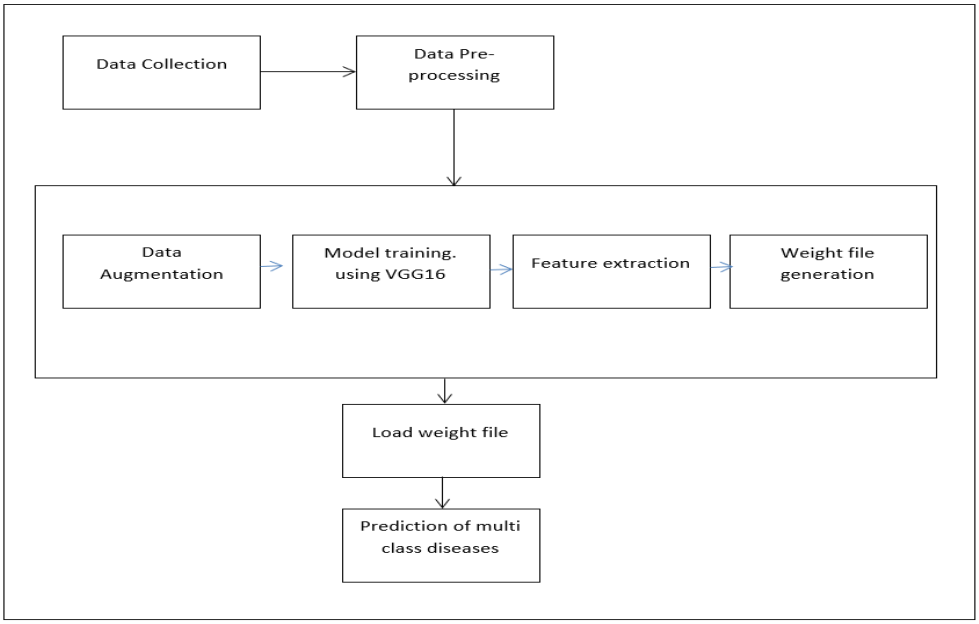

Fig. 2 Model Training Flow Diagram

Data collection and Data pre-processing are mentioned in above Fig 2:

Training flow: Once Data are pre-processed will undergo data augmentation in which corrupted images are removed along with data set division takes place in which 80% training and 20% for validation set along with all the images are converted to needed size or normalization takes place.

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These processed images are used for model training here Vgg16 CNN algorithm is used in which model will be trained for 3 cycles where feature extraction takes place and the model will be trained .training the model will be one time activity in which trained model/weight file will be used for prediction. Prediction will happen based on the user x ray images will model will predict the disease.

VII. CONCLUSION

The trained VGG-16 model the researchers proposed in this research study for the COVID-19 detection and pneumonia detection on chest x-ray images using the CNN method have meaningful results. The developed CNN model was effective in extracting features from an x-ray image and forecast the occurrence or nonexistence of COVID-19, bacterial, and viral-pneumonia. Likewise, testing-data in the research was intensified through data augmentation techniques. In addition to the improvement of computerrelated applications in the medical division, COVID-19 and pneumonia can be efficiently found employing chest radiographs with the support of CNN and deep learning technologies. Methodologies developed in the conduct of this research in which COVID-19, bacterial, and viral-pneumonia can be forecast with greater accuracy, and in this case our study obtained 95% accuracy. The medical field through automated diagnosis is the essential area that will gain precisely from this research. Future studies can make better a performance of CNN architecture by tuning the hyperparameters and transfer learning combinations. Improved complex network-structure might likewise achievable to determine the best model for pneumonia and the COVID-19 detection system.

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